

## **CLAIMS**

1. A method for extending a directory schema independent of schema modification, the method comprising:

instantiating an object instance of a content class comprising a flexible attribute that is based on a complex data type, the object instance being created in a directory based on the directory schema, the content class and flexible attribute being defined in the directory schema; and

assigning a property to the attribute, the property being operational or data providing in nature, the property having a data type that is independent of the complex data type.

2. A method as recited in claim 1, wherein the directory schema is independent from any values that the object instance may store.

3. A method as recited in claim 1, wherein the complex data type is an XML data type.

4. A method as recited in claim 1, wherein the first property is described by an XML string, the XML string being compatible with the complex data type.

5. A method as recited in claim 1, wherein the first property is described by an XML string, the XML string being compatible with the complex data type.

1           6.     A method as recited in claim 1, wherein the directory schema defines  
2 a plurality of object classes for a versioning aware directory.

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4           7.     A method as recited in claim 1, wherein the object instance is a first  
5 object instance, wherein the property is the first property comprising a particular  
6 number of data elements, and wherein the method further comprises:

7                 independent of directory schema modification:

8                     (a) instantiating a second object instance of the content class, the  
9 second object comprising a second flexible attribute that is based on the complex  
10 data type;

11                    (b) assigning a second property to the second flexible attribute, the  
12 second property having a different number of data elements than the first property;  
13 and

14                    (c) wherein each data element in the first and second properties  
15 comprises data such neither the first or second properties contribute to data  
16 sparsity of a directory based on the directory schema.

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18           8.     A method as recited in claim 1, wherein the object instance is a first  
19 object instance, wherein the property is the first property, and wherein the method  
20 further comprises:

21                 without modifying the directory schema, instantiating a second object  
22 instance of the content class, the second object comprising a second flexible  
23 attribute that is based on the complex data type; and

1 assigning a second property to the second flexible attribute, the second  
2 property being completely independent of any operational or data characteristics  
3 of the first property.

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5 **9.** A method as recited in claim 8, wherein the first and second  
6 properties are described by respective XML strings that are compatible with the  
7 complex data type.

8  
9 **10.** A server comprising:  
10 a processor coupled to a memory, the memory comprising computer  
11 executable instructions, the processor being configured to fetch and execute the  
12 computer-executable instructions for:

13 instantiating an object instance of a content class comprising a  
14 flexible attribute that is based on a complex data type, the content class and  
15 flexible attribute being defined in a directory schema; and

16 assigning a property to the attribute, the property being operational  
17 or data providing in nature, the property having a data type that is independent of  
18 the attribute's data type.

19  
20 **11.** A server as recited in claim 10, wherein the directory schema is  
21 independent from any values that the object instance may store.

22  
23 **12.** A server as recited in claim 10, wherein the complex data type is an  
24 XML data type.

1           13.    A server as recited in claim 10, wherein the first property is  
2 described by an XML string, the XML string being compatible with the data type.

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4           14.    A server as recited in claim 10, wherein the directory schema  
5 defines a plurality of object classes for a versioning aware directory.

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7           15.    A server as recited in claim 10, wherein the object instance is a first  
8 object instance, wherein the property is the first property comprising a particular  
9 number of data elements, and wherein the computer-executable instructions  
10 further comprise instructions for:

11           independent of directory schema modification:

12                   (a) instantiating a second object instance of the content class, the  
13 second object comprising a second flexible attribute that is based on the complex  
14 data type;

15                   (b) assigning a second property to the second flexible attribute, the  
16 second property having a different number of data elements than the first property;  
17 and

18                   (c) wherein each data element in the first and second properties  
19 comprises data such neither the first or second properties contribute to data  
20 sparsity of a directory based on the directory schema.

1           16.     A server as recited in claim 10, wherein the object instance is a first  
2 object instance, wherein the property is the first property, and wherein the  
3 computer-executable instructions further comprise instructions for:

4                 without modifying the directory schema, instantiating a second object  
5 instance of the content class, the second object comprising a second flexible  
6 attribute that is based on the complex data type; and

7                 assigning a second property to the second flexible attribute, the second  
8 property being completely independent of any operational or data characteristics  
9 of the first property.

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11           17.     A server as recited in claim 16, wherein the first and second  
12 properties are described by respective XML strings that are compatible with the  
13 complex data type.

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15           18.     A computer-readable medium comprising computer-executable  
16 instructions for:

17                 instantiating an object instance of a content class comprising a flexible  
18 attribute that is based on a complex data type, the content class and flexible  
19 attribute being defined in a directory schema; and

20                 assigning a property to the attribute, the property being operational or data  
21 providing in nature, the property having a data type that is independent of the  
22 complex data type.

1           **19.**    A computer-readable medium as recited in claim 18, wherein the  
2    directory schema is independent from any values that the object instance may  
3    store.

4  
5           **20.**    A computer-readable medium as recited in claim 18, wherein the  
6    directory schema defines a plurality of object classes for a versioning aware  
7    directory.

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9           **21.**    A computer-readable medium as recited in claim 18, wherein the  
10   complex data type is an XML data type.

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12           **22.**    A computer-readable medium as recited in claim 18, wherein the  
13   first property is described by an XML string, the XML string being compatible  
14   with the complex data type.

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16           **23.**    A computer-readable medium as recited in claim 18, wherein the  
17   object instance is a first object instance, wherein the property is the first property  
18   comprising a particular number of data elements, and wherein the computer-  
19   executable instructions further comprise instructions for:

20           independent of directory schema modification:

21                   (a) instantiating a second object instance of the content class, the  
22   second object comprising a second flexible attribute that is based on the complex  
23   data type;

1 (b) assigning a second property to the second flexible attribute, the  
2 second property having a different number of data elements than the first property;  
3 and

4 (c) wherein each data element in the first and second properties  
5 comprises data such neither the first or second properties contribute to data  
6 sparsity of a directory based on the directory schema.

7  
8 **24.** A computer-readable medium as recited in claim 18, wherein the  
9 object instance is a first object instance, wherein the property is the first property,  
10 and wherein the computer-executable instructions further comprise instructions  
11 for:

12 without modifying the directory schema, instantiating a second object  
13 instance of the content class, the second object comprising a second flexible  
14 attribute that is based on the complex data type; and

15 assigning a second property to the second flexible attribute, the second  
16 property being completely independent of any operational or data characteristics  
17 of the first property.

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19 **25.** A computer-readable medium as recited in claim 24, wherein the  
20 first and second properties are described by respective XML strings that are  
21 compatible with the complex data type.

1           **26.**     A directory schema data structure comprising:

2           a flexible attribute data field that indicates a data type, the complex data  
3 type being used to express various operational or data providing properties of the  
4 flexible attribute, the various operational or data providing properties being  
5 independent of the data type and independent of any modification to the directory  
6 schema; and

7           a flexible structural object content class comprising the flexible attribute.

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9           **27.**     A directory schema data structure as recited in claim 26, wherein  
10 the directory schema is independent from any values that an object instance  
11 comprising the flexible attribute may store.

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13           **28.**     A directory schema data structure as recited in claim 26, wherein the  
14 flexible attribute data field provides, independent of modification to the directory  
15 schema, for application instantiation of first and second objects based on the  
16 flexible attribute, the first and second objects being instantiated into a directory  
17 database based on the directory schema, the first object having a different number  
18 of data elements as compared to a number of data elements in the second object,  
19 the application instantiation not contributing to data sparsity of the directory  
20 database.

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22           **29.**     A computer-readable medium comprising a data structure as recited  
23 in claim 26.  
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25



1           **30.**    A computer comprising a computer-readable medium comprising a  
2 structure as recited in claim 26.

3  
4           **31.**    In a distributed computing system, a computer comprising a  
5 computer-readable medium comprising a structure as recited in claim 26.

6  
7           **32.**    A server for extending a directory schema independent of schema  
8 modification, the server comprising:

9           processing means for:

10           instantiating an object instance of a content class comprising a  
11 flexible attribute that is based on a complex data type, the content class and  
12 flexible attribute being defined in a directory schema; and

13           assigning a property to the attribute, the property being operational  
14 or data providing in nature, the property having a data type that is independent of  
15 the complex data type.

16  
17           **33.**    A server as recited in claim 32, wherein the directory schema is  
18 independent from any values that the object instance may store.

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20           **34.**    A server as recited in claim 32, wherein the complex data type is an  
21 XML data type.

1           **35.**   A server as recited in claim 32, wherein the first property is  
2 described by an XML string, the XML string being compatible with the complex  
3 data type.

4  
5           **36.**   A server as recited in claim 32, wherein the first property is  
6 described by an XML string, the XML string being compatible with the complex  
7 data type.

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9           **37.**   A server as recited in claim 32, wherein the directory schema  
10 defines a plurality of object classes for a versioning aware directory.

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12           **38.**   A server as recited in claim 32, wherein the object instance is a first  
13 object instance, wherein the property is the first property comprising a particular  
14 number of data elements, and wherein the server further comprises processing  
15 means for:

16           independent of directory schema modification:

17           (a) instantiating a second object instance of the content class, the  
18 second object comprising a second flexible attribute that is based on the complex  
19 data type;

20           (b) assigning a second property to the second flexible attribute, the  
21 second property having a different number of data elements than the first property;  
22 and

23           (c) wherein each data element in the first and second properties  
24 comprises data such neither the first or second properties contribute to data  
25 sparsity of a directory based on the directory schema.

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2       **39.**     A server as recited in claim 32, wherein the object instance is a first  
3 object instance, wherein the property is the first property, and wherein the server  
4 further comprises processing means for:

5             independent of modification to the directory schema, instantiating a second  
6 object instance of the content class, the second object comprising a second flexible  
7 attribute that is based on the complex data type; and

8             assigning a second property to the second flexible attribute, the second  
9 property being completely independent of any operational or data characteristics  
10 of the first property.  
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12       **40.**     A server as recited in claim 39, wherein the first and second  
13 properties are described by respective XML strings that are compatible with the  
14 complex data type.  
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